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BRAZEAU DAM

TASK FORCE

REPORT

Prepared For The

Conservation and Utilization Committee

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Edmonton, Alberta

March, 1972

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INTRODUCTION

PURPOSE OF STUDY

Since the construction of the Brazeau Dam, which was preceded by a decision of the Government that the reservoir area would not be completely cleared of standing timber, a problem has existed in the reservoir area with respect to floating and other debris which, aside from an aesthetic and fire hazard problem, has seriously hampered recreational use of the reservoir area for boating, fishing and like recreational pursuits.

The Conservation and Utilization Committee was requested to initiate a task force which was charged with the following responsibilities:

(1) To state the current situation with respect to clearing of the reservoir area.

(2) To state the current situation with respect to the proposed clearing of the canal area and the relative responsibility of Calgary Power.

(3) To recommend the necessary clearing to be undertaken preparatory to raising of the reservoir full supply level in relationship to the reservoir recreational potential.

(4) To comment with regard to the decaying of wood residue and its potential water pollution effects for the City of Edmonton.

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(5) To assess the recreation potential of the Brazeau Dam Reservoir area after removal of floating and standing trees from the area.

(1) HISTORY OF CLEAN-UP -- RESERVOIR AREA

Prior to filling the Brazeau Reservoir, consideration was given to clearing the timber from the proposed reservoir area. Tenders were called for the clearing of the area and because of the costs involved, it was decided that the area would not be completely cleared. Tenders were called for removal of merchantable timber from the proposed reservoir and subsequently seven timber berths were issued and most of the merchantable timber was harvested from these operations. The timber remaining in the reservoir, therefore, was that which was not merchantable.

After an inspection of the Brazeau Dam Reservoir area from the air and on-the-ground July 2, 1968 by the Alberta Forest Service, it was recommended to the Minister of the Department of Lands and Forests that the department undertake the clean-up of the reservoir area. The matter of clean-up was referred to the Executive Council and it was agreed that the clean-up of the reservoir area should be done when funds were available.

On June 21, 1969, an experimental burn of driftwood was undertaken by volunteers from the Alberta Fish and Game Association with the co-operation of the Alberta Forest Service and from this trial, it was found that the fines burnt completely but the larger trees and logs did not burn. A small portion of the wood was piled with a front-end loader and this burnt completely.

Funds were made available for the clean-up operation starting

in 1970-71 and the operation is continuing.

Clearing of the reservoir area is presently being carried out to the 3,170 foot elevation contour. The dam has potential storage to the 3,200 foot elevation contour and storage to this level may be required in approximately fifteen to twenty years. A decision will have to be made in the future as to whether this area between the 3,170 and 3,200 foot contours will be cleared.

PROBLEM

Over the years, the ice falling as the water draw-down occurs has broken off trees, especially those standing below full supply level. Trees in shallow water and along the shoreline were killed, but have stood as snags. The result has been floating bodies of debris that move with the wind and hang up in large rafts along the shore when trapped by the standing snags. From the 1969 air photos, it was estimated that there were 1,000 plus acres of driftwood on the reservoir. In 1971, the water level was raised an additional six feet to an elevation of 3,170 feet above sea level. This did not increase the floating wood appreciably, but it did inundate several hundred more acres of standing green trees.

METHOD

In the summer of 1970, the Alberta Forest Service allotted $110,000.00 toward the clean-up of the reservoir. A large tug

boat was rented to tow booms and a special jack ladder was purchased to handle logs, limbs and whole trees with roots. Operations during the year were not too successful. The tug had to be modified on the bow so it could penetrate the rafts of wood. Many problems were found in the ladder and there were alterations and additions required. The greatest problem, however, was a shortage of water because of light snow pack the previous winter and little precipitation during the following summer. The reservoir never did reach full supply which was required to free the wood from the shoreline.

In the winter of 1970-71, the low water of the previous summer was an asset, in that it was possible to clear with bulldozers the new area to be flooded and some areas previously flooded. Many acres of standing snags were piled and burnt without difficulty. In all, 1,800 acres were cleared before spring break-up. The area is not a first class job. The muskeg did not freeze because of deep snow and some areas could not be worked with machinery. The snow, which was three feet deep by spring, required that some areas be repiled two or three times. The final result was that about 90% of the 1,800 acres was completely burnt. Some piles and windrows still remain to be burnt.

In 1971, $70,000.00 was allotted for clean-up. During the year, in addition to the jack ladder, a three-quarter yard crane with clam and a new tug boat were hired. The tug is 16' x 24' with twin 283 cubic inch truck motors, twin screws and marine transmissions. It tows well up to ten acre booms and can push the rafts of wood up to

the crane. The boat has been the most successful feature of the operation. If the wood is held tight to the shore, the crane operator can come up with a full load at every swing.

The crane owner also built a special clam to handle this debris. The result has been good. An estimated 60,000 cords were loaded out in the summer of 1971.

In comparing the jack ladder and the clam, it appears that the clam will outperform the jack ladder by about four to one. In addition, the jack ladder requires a bulldozer to push the wood away once it has fallen off the top end. It also requires four to six men to feed wood in from the lower end.

PRESENT AND FUTURE PLANS

As a Winter Works Project, the Alberta Forest Service has established a camp near the dam site with facilities for thirty men. At present, the crew (sixteen employees) is working in the extreme south end of the reservoir where there are 700 acres of standing dead and green trees which are being hand felled.

When the water drops sufficiently to pick up the snags along the shoreline, two or three crews of seven men each will fall snags which will release the trapped floating debris at next high water.

Crews will be increased to twenty men by December 20, 1971 and a further increase to thirty men by January 3, 1972, if such an increase would be efficient. At present, the crew is being transported

with nine passenger vehicles on bush roads to the top end of the reservoir. They are being moved from there by snowmobile and ski-boose along the shoreline.

It is planned to give priority to the shoreline and the lower end of the reservoir when the ice drops to a point where all standing snags may be cut in one pass. This is the area which receives the most attention from the public. After the shoreline is completed, efforts will be concentrated in the two mile, 700 acre stretch in the upper reservoir.

SUMMER OF 1972

It is planned to abandon the jack ladder for the summer and use two cranes, one forestry owned and the other hired. Two boats will be required, one to tow booms and the other to push wood up to the cranes. A "cat" may be required to level trails around the load out area so that the cranes have a level pad to work from. Estimated cost for equipment hire - $600.00 per day.

BRAZEAU CANAL AREA

A portion of this area was inspected by Contractor Carson, Forest Officer McPhail and Sutherland on December 13, 1971 with a view to clearing. Since the water in the canal does not fluctuate more than a foot or two, a different method of clearing would be used.

A hole was cut in the ice around one of the snags which was standing in twelve feet of water. It was found that the tree was very loosely rooted and most wobbly. There is no doubt that the trees would be down now if it were not for the water-logged butt which holds them up like a buoy. The fact, that the lower portion of the tree is water-logged, may cause some difficulty in clearing. On this subject some bath tub experiments will be done in proportion of water-logged section to dry section, to see if a good float would be obtained. If the trees would float in a near horizontal position after being pushed over, there would be no problem. It is thought that a wider pontoon boat, similar to the one used last summer, with a horizontal push bar eight feet off the water would knock the trees down. A second boat to boom and a crane to load out will also be required.

If the butt logs tend to pull the whole tree down, there would be problems with hang-ups and with booming. If this should occur, then an electric driven chain saw to cut off the trees three or four feet below the surface would be the best answer.

If approval to clear the canal is given, the same equipment could be used on the reservoir by working the canal in the early part of the season after break-up and proceeding to the reservoir in late June when water levels are high enough to work.

SUMMARY

The past summer was very productive in volume of wood removed from the reservoir. Most of the credit should go to Gordon Carson, the contractor, from whom we hired the boat and crane. He not only had an excellent knowledge of debris disposal and mechanics, but he designed and built a boat suitable for the operation.

(2) CLEAN-UP -- POWER CANAL AREA

Calgary Power Ltd. were approached by the Department of Lands and Forests with respect to the clean-up of standing dead timber in the canal area below the Brazeau Dam spillway. Calgary Power have assumed the operating costs of the equipment to be involved in the removal of the standing dead timber in the canal in an amount of $30,000.00 which is the amount estimated to be required to complete the operation. The Department of Lands and Forests will furnish supervisory services during the clean-up operation.

It may become necessary at strategic times to lower the water level in the canal in order to remove the trees in shallow water and Calgary Power have indicated that it will be possible at times to drop the level by approximately five feet for limited periods of time. Changes of operating level of the canal will be closely co-ordinated with the plant superintendent as load emergencies may require rapid restoration of the canal to normal operating levels.

In view of the decision by Calgary Power Ltd. to undertake financial responsibility for the clean-up of the canal, work is to proceed immediately.

(3) ADDITIONAL CLEARING REQUIRED

At the time of the formation of the Task Force, it was indicated that the reservoir full supply level was to be raised which would inundate additional areas of timber which would have to be cleared in addition to the clearing required of the previously flooded area.

Information which was received by the Task Force was to the effect that the full supply level had already been raised to the 3,170 foot level and that the current clearing operations underway were related to the new full supply level, therefore, no special recommendations are required in this regard at this time with respect to additional clearing and future recreation potential.

As indicated on Page 4, the Task Force was advised that the potential future full supply level of the Brazeau Reservoir could be placed at the 3,200 foot level. The present clearing is being carried out to the 3,170 foot level with some variation beyond this. Storage to the 3,200 foot level will not be required for fifteen to twenty years and a decision will have to be made in the future as to the desirability of additional clearing in view of the following comments with respect to the recreation potential of the reservoir. In view of the limited recreation potential of this reservoir, the Task Force would not recommend additional clearing to the 3,200 foot level for purely recreational considerations although certainly it would be desirable from an aesthetic standpoint.

(4) POSSIBLE POLLUTION EFFECTS OF DECAYING WOOD RESIDUE

The Division of Pollution Control regularly monitors the water quality in the Brazeau Dam. The analytical data indicate that the quality of the impounded water has been satisfactory and that continued operation of this facility should not present adverse effects on users of the North Saskatchewan River downstream.

DISCUSSION

1. Water Quality Data

Water quality data obtained during last years field surveillance (April 22, 1970 - March 9, 1971) indicated that the chemical parameters were at satisfactory levels.

Parameter	Median Value	Comments
Dissolved Oxygen	8.9 mg/l	satisfactory
pH	8.0	slightly alkaline
Turbidity	1 mg/l	clear
Total Hardness	170 mg/l	low-medium hardness
Nutrients - Ammonia	0.2 mg/l	satisfactory
Nutrients - Phosphates	0.1 mg/l	satisfactory
Phenols	2 ppb	satisfactory
Oils and Grease	0.9 mg/l	satisfactory
Bacteriological Constituents:		
Total Coliforms	0	satisfactory
E. Coli	0	satisfactory
Threshold Odor Number	4 - musty	satisfactory
Biochemical Oxygen Demand	0.6 mg/l	satisfactory

2. Taste and Odor

Storage reservoirs always present the potential of taste and odor problems. These problems are associated with sources of trace organics which may originate from: (a) natural runoff, (b) industrial wastes, (c) domestic wastes, and (d) metabolic products of aquatic life and microbial action. The degradation products of aquatic life and natural runoff sources represent the only potential problems in the Brazeau Dam; however, analytical data obtained to date has not shown this to be the case.

Deterioration of water quality usually occurs when a reservoir site is initially flooded and organic residues begin to decompose below the rising waters; odor, tastes and color may become intensified. The reservoir waters become stabilized when the biodegradable substances are minimized over a period of time. It is felt that stabilization of the Brazeau Dam with respect to decomposition of the original top soil material in the reservoir bed has already occurred over the last nine years of reservoir operation. Submerged timber wood represents a more dense substrate for microbial induced decomposition and the effects (i.e., phenolic releases) may be difficult to quantify. A theoretical approach would require the correlation of various factors including temperature, amount of submerged timber, rate of decay, decomposition products, etc. Taste and odor problems are also derived from the presence of natural trace organics occurring during spring runoff;

however, this is only a temporary condition. At the moment, standard analytical tests and continued monitoring at the Brazeau Dam and at downstream locations along the North Saskatchewan River provides the best means of determining trends in water quality.

The matter of the potential implications resulting from decayed wood residuals in the Brazeau Reservoir was discussed by Mr. P. G. Shewchuk of the Department of the Environment with Dr. R. Green of the Research Council of Alberta with the result that any attempt to quantify the effects of the active decomposition of wood residuals would require an extensive research investigation. This may not be necessary in view of the fact that the standard analytical data (above) show that median phenolic concentrations as well as other water quality levels are at a satisfactory low level. Peak phenolic values may, however, prove troublesome from a taste and odor standpoint. This current data is evidence that continued releases of water from the Brazeau Reservoir should not create adverse water quality effects for the downstream users of the North Saskatchewan River, however, continuous monitoring of the Brazeau Reservoir and the North Saskatchewan River basin is an on-going program conducted by the Department of the Environment.

(5) RECREATIONAL CAPABILITY - BRAZEAU RESERVOIR

According to the Canada Land Inventory Land Capability Classification for Outdoor Recreation, the shoreland and adjacent uplands of the Brazeau Dam area are rated as follows:

I. Shoreland

A. Camping, (K)* - Of the total shoreline surrounding the reservoir and canal, only 3 1/2% is either capable of sparse cottage development (i.e., the equivalent of one cottage every 500 feet), fronting on water lacking severe limitations to family water-oriented activity, or may be capable of 50% cottage development (i.e., the equivalent of one cottage every 200 feet) but with severe but not prohibitive limitations to water-oriented family activity (areas designated 5N on map)*.

As we shall see, it is apparent to us that the shoreland classification of this reservoir was done with the thought that the areas to be inundated would be cleared prior to flooding. Consequently, it is felt, that probably the sparse development capability applied in this case.

As there are no areas along the shore of the reservoir or canal rated for camping, we must assume that the areas shown as 5N on Canada Land Inventory Recreation Capability map in the back of this report would offer the only possible opportunity for campground development. Until adequate ground reconnaisance is made of these

(* Numbers and letters refer to Outdoor Recreation Capability Map -- Appendix 2)

two shoreland areas (indicated in light yellow on Canada Land Inventory map), no proper assessment can be made nor can any promise of suitable campground sites around the reservoir or canal be forthcoming. It is noted that one 5N area is completely surrounded by muskeg and water and the other area has sufficient surrounding muskeg to present rather serious access problems from the existing roads.

It is also to be noted that the only moderate ratings (for all categories, including camping), are to be found upstream from the reservoir on the Brazeau and Elk Rivers and downstream from the dam on the Brazeau River plus the dam itself and one viewpoint area to the northeast (all colored medium yellow). It can safely be assumed that the only effect the Brazeau Dam has had on recreational values of the area is to lower them.

B. Angling (A) and Family Boating (Y) - Sixty-two percent of the total shoreline is rated by Canada Land Inventory as having family boating capability but with only occasional moderately low capability sites for land to water access. These shorelands obviously have very limited or minimal capability for recreational activity, other than as a possible stopping place, with moderate to severe limitations, for boating parties.

These same shoreland units indicate a lack of more dominant features but that access is possible by boat to water with moderate to good fishing capability.

Had the Canada Land Inventory raters been aware of the existing conditions with regard to the massive quantities of floating logs, it is reasonable to expect the total lack of family boating capability and a very low angling capability. It, therefore, must have been assumed that all trees within the reservoir would be cleared.

Assuming a 100% removal of floating trees, we still question the boating capabilities due to the constant possibility of submerged trees breaking loose and floating to the surface. Aside from the aesthetic considerations, an occasional log floating or partially submerged can create a severe safety hazard.

Fishing capabilities of the Brazeau Reservoir and canal are at present open to question. Some preliminary data were collected during 1969 by Biologist C. Hunt. Travel on the lake was treacherous and field work was seriously hampered at that time because of floating or submerged timber. Temperature and dissolved oxygen data suggested that neither would be limiting factors to trout survival during the summer. Northern pike, dolly varden, long nose suckers, white suckers and burbot inhabit the reservoir and canal. Northern pike and dolly varden up to fifteen pounds have been taken by anglers during recent years, however, no creel census data has been collected to show the amount of angler use or success.

The data collected, though sketchy to date, suggests that

the reservoir has potential to support a mediocre trout fishery. Resident fish populations, available food, spawning requirements, habitat preferences and other parameters will have to be given special consideration in establishing the most desirable species to introduce. Draw-downs will have to be given serious consideration as the spawning of certain salmonids could be destroyed and dangerous ice conditions created for people attempting to utilize the reservoir for recreation.

In addition to the shoreline mentioned above, another 21% is considered to border water with a low to moderate capability for angling.

C. Man-made Features (Z) and Viewing (V) - Thirteen and one-half percent of the shoreline is man-made having a moderate (main dam) to moderately low (canal dikes) recreational appeal. In addition, these features plus a hill to the northeast provide locally superior views (from dam and hill designated 4V) to a good view of uninteresting land forms (from canal designated 5V).

D. Wildlife (O - upland and W - wetland) - In addition to angling and boating, 83% of the shoreland is rated moderately low (62%) to low (21%) for wildlife. This indicates large areas with moderate to high capability for viewing or hunting upland wildlife species but without other significant recreational capability; or areas containing large to small but significant concentrations of waterfowl in season, capable of sustaining viewing and interpretation

or hunting on a fairly intensive level, but with limitations on accessibility, length of season, or tolerance of species to human activities. In general, hunting capability is rated high for both upland and wetland species with viewing capability moderate. Higher ratings (2-4 Canada Land Inventory) would indicate higher viewing and interpretive capabilities but exclude hunting. An example would be Banff National Park where Rocky Mountain sheep are easily viewed in large numbers along the highway for a significant portion of the year but where, obviously, hunting is not a factor to be considered.

II. Uplands

The majority of the surrounding uplands is rated low to moderately low for both upland and wetland wildlife. The same comments apply as in D above. In addition, a significant portion of the surrounding uplands contains areas where natural landscape is diverse enough to contribute to the recreational capability.

SUMMARY

In summary, the Brazeau Reservoir appears to have limited recreational potential. Its distance from major population centres and the availability of closer and better bodies of water (including the Bighorn Reservoir under construction) reduces the

significance of this reservoir as a source of water based recreation to a local level. Its main source of users would probably come from the Drayton Valley area.

Hunting would appear to be this areas major attraction on a regional level. Snowmobiling and boating would be primarily a local attraction. Fishing, if the potential materializes into actuality, certainly would be a major local attraction and possibly a regional one on a minor scale.

Campgrounds for hunters and snowmobilers could be built in more suitable locations along the Brazeau or Elk Rivers as the reservoir itself holds little attraction of its own for these people. Providing a decent campground for fishermen and boaters who are attracted specifically to the reservoir becomes a more difficult proposition. A few crude facilities exist near the main dam (indicated in green on Canada Land Inventory map) in a borrow pit area. While a few basic facilities could be provided in this cleared flat area, a recreation area built to Alberta Forest Service standards at this location is out of the question due to size, topographic and vegetative limitations.

On-the-site ground reconnaisance will be necessary to select sites suitable for campground and boat launching facilities. It is our opinion based on studies of aerial photographs and Canada Land Inventory maps that a less than adequate site is the best the shores of Brazeau Reservoir have to offer.

(6) COMMENTS ON PROBLEMS ASSOCIATED WITH RECREATIONAL USE OF RESERVOIRS

Although reservoirs receive heavy recreational use in various parts of North America they are not an ideal resource for the majority of popular forms of outdoor recreation activities. In areas where no alternatives exist, reservoirs can serve a real need. In areas where alternatives exist they tend to receive little general use although specific attractions may be present which allows a specific recreation activity.

Reservoirs have basically three problems associated with recreational use; fluctuating water levels, newness in geological time and a management and construction rationale other than recreation, usually power or irrigation. Many of the problems of the recreational use of reservoirs could be solved by locating, designing and constructing them specifically for recreational use. Likewise existing reservoirs could be managed to better meet the needs of recreation users and activities. These latter problems are management ones and are not considered further.

The geological newness of reservoirs make them undesirable on a number of counts which is compounded by their usual location in narrow, deep valley areas. The steep reservoir banks, both above and below high water, make access to and from the water difficult and often dangerous. This steepness is often exaggerated after a short period of time by slumping and sliding banks. The uncertainty of when and where future earth falls will occur make the use of

shore zone areas potentially hazardous. The length of time required to stabilize shorelines depends in part upon the soil parent material and the management methods of the reservoir. The lack of medium to coarse textured soil particles often leads to a soft silty lake bottom strewn with rocks and boulders. This type of material is unpleasant to walk through and the water becomes very dirty with suspended material at even low levels of use or with wave action. On steeper slopes this material is very slippery and makes access treacherous. Beach areas are usually not present as wave action has not had time to sort or deposit sandy materials in bays.

Fluctuating water levels tend to prevent a maturation of the shore zone since the water and wave action is never concentrated for any period of time at a point on the shore. In some cases the wetting and drying of soil material along the shores leads to increased instability. The fluctuations of water levels are also harmful to wildlife habitats preventing the development of stable plant and animal communities; fish, shorebirds and waterfowl in general are scarce due to the unproductive and unnatural habitat. The construction of recreation facilities is rendered more difficult and expensive, particularly boating facilities, when water levels fluctuate excessively. The aesthetics of reservoirs are often poor. Both the extensive mud flats, which occur in shallow gradient areas after draw-down, and the severely eroded banks in steeper areas are visually unpleasant.

From the above, it appears that reservoirs are often not a family oriented resource. They tend to be most suitable for boating or active water oriented uses since they suffer most from hazards and problems associated with use of the shore zone as for bathing, camping, cottaging, viewing, etc. The physical resource is often hazardous in use, therefore, discouraging for many family groups. If reservoirs have a specific attraction such as fishing potential, they will attract the recreationist interested primarily in this activity. They are usually not a resource to which the general recreationist or tourist can be attracted any great distance. They serve only the population in their immediate hinterland or that which is unable to find an alternative within a reasonable distance.

Although reservoirs are not ideal for recreation use, they can be developed to provide recreation opportunities to a large number of people if no other alternatives are present. In Alberta, reservoirs constructed south of Olds may receive heavy recreational use despite their inherent disadvantages in respect to natural lakes. Even in this region, which has few if any natural lakes the present recreational use of the majority of reservoirs is low. With management methods designed to maintain a high and relatively stable water level over the June 1 to September 15 period, reservoirs could be expected to generate and sustain a relatively heavy recreational use given that suitable soil and topographic conditions are

present in adequate quantities. Even in the region north of Olds, this may be true if reservoirs are located closer to population centres than alternative resources or possess special or unique resource conditions.

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